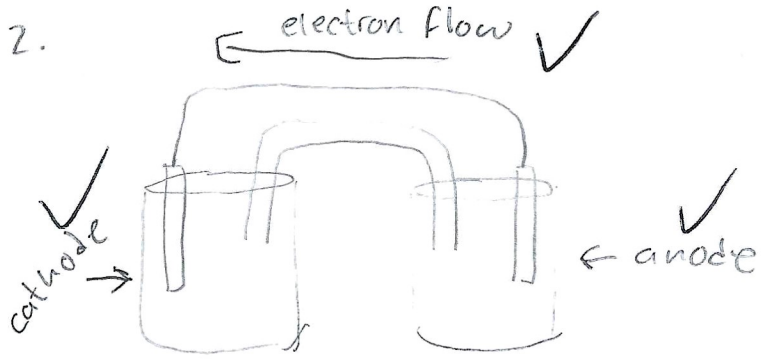
Quarterly Test #3

1. Oxidizing agent: Cl_2 ✓
Reducing agent: H_2O_2 ✓

2.



$Ag^+ + e^- \rightarrow Ag$ $\quad Zn \rightarrow Zn^{2+} + 2e^-$ ✓

Cell potential

$0.7791 - (-0.763)$ ✓
$= 1.562$ volts ✓

100%

3. $0.440 + 0.15$
$= 0.59$ volts ✓

$2(Fe \rightarrow Fe^{2+} + 2e^-)$
$+ Sn^{4+} + 4e^- \rightarrow Sn$
$= 2Fe \rightarrow 2Fe^{2+} + 4e^-$
$+ Sn^{4+} + 4e^- \rightarrow Sn$

$2Fe + Sn^{4+} \rightarrow 2Fe^{2+} + Sn$ ✓

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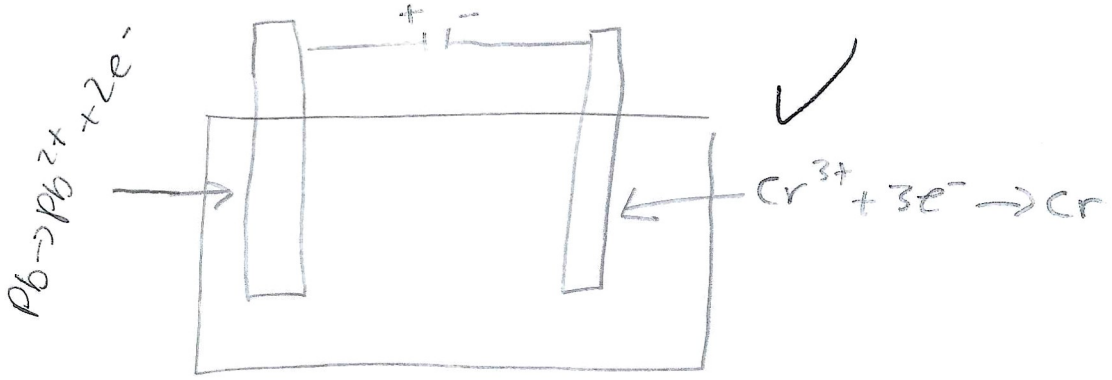
4. $Mn \rightarrow Mn^{2+} + 2e^-$ $\quad E^\circ = 1.18$ volts
$Cu^{2+} + 2e^- \rightarrow Cu$ $\quad E^\circ = 0.337$ volts
1.52 volts standard potential ✓

$$E_{cell} = E^\circ - \frac{0.05916}{n}(\log(Q))$$

$$E_{cell} = 1.52 \text{ volts} - \frac{0.05916}{2}\left(\log\left(\frac{0.150}{1.50}\right)\right)$$

$= 1.52 + 0.02958 = 1.55$ volts ✓

5.



6. $10.0 \frac{C}{sec}(7200\ sec) = 7.20 \times 10^4\ C$ ✓

$7.20 \times 10^4 \left(\frac{1\ mole\ of\ electrons}{96485}\right) = 0.746\ moles\ of\ electrons$ ✓

$0.746\left(\frac{1\ mole\ of\ Cr}{3}\right) = 0.249\ moles\ of\ Cr$ ✓

$0.249\left(\frac{52.0\ g\ of\ Cr}{1}\right) = 12.9\ g\ of\ Cr$ ✓

7. 1. Mn^{2+} 2. Cl_2 3. Au^{3+}

8. $Cr_2O_7^{2-} + Fe^{2+} \rightarrow Cr^{3+} + Fe^{3+}$ $\quad Fe^{2+} \rightarrow Fe^{3+} + e^-$ ✓

$Cr_2O_7^{2-} + e^- \rightarrow Cr^{3+}$ ✓

$= Cr_2O_7^{2-} + e^- \rightarrow 2Cr^{3+}$ ✓

$= Cr_2O_7^{2-} + 6e^- \rightarrow 2Cr^{3+}$ ✓

ADD WATER

$Cr_2O_7^{2-} + 6e^- + 14H^+ \rightarrow 2Cr^{3+} + 7H_2O$ ✓

$+ \ 6(Fe^{2+} \rightarrow Fe^{3+} + e^-)$ ✓

$Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+} \rightarrow 2Cr^{3+} + 7H_2O + 6Fe^{3+}$ ✓

9. $CuS + NO_3^- \rightarrow Cu^{2+} + S + NO$

Oxidation: $CuS \rightarrow Cu^{2+} + S + 2e^-$ ✓

Reduction: $NO_3^- + 3e^- \rightarrow NO$ ✓

$NO_3^- + 3e^- + 4H_3O^+ \rightarrow NO$

$NO_3^- + 3e^- + 4H_3O^+ \rightarrow NO + 6H_2O$

$3(CuS \rightarrow Cu^{2+} + S + 2e^-)$ ✓

$2(NO_3^- + 3e^- + 4H_3O^+ \rightarrow NO + 6H_2O)$

$= 3CuS \rightarrow 3Cu^{2+} + 3S + 6e^-$

$+ 2NO_3^- + 6e^- + 8H_3O^+ \rightarrow 2NO + 12H_2O$

$3CuS + 2NO_3^- + 8H_3O^+ \rightarrow 3S + 2NO + 12H_2O$ ✓

10. Oxidation: $Ni(OH)_2 \rightarrow NiO_2 + 2e^-$

$= Ni(OH)_2 + 2OH^- \rightarrow NiO_2 + 2e^-$

$= Ni(OH)_2 + 2OH^- \rightarrow NiO_2 + 2e^- + 2H_2O$ ✓

Reduction: $Zn(OH)_2 + 2e^- \rightarrow Zn$ ✓

$Zn(OH)_2 + 2e^- \rightarrow Zn + 2OH^-$ ✓

$Ni(OH)_2 + 2OH^- \rightarrow NiO_2 + 2e^- + 2H_2O$

$+ Zn(OH)_2 + 2e^- \rightarrow Zn + 2OH^-$

$Ni(OH)_2 + Zn(OH)_2 \rightarrow NiO_2 + 2H_2O + Zn$ ✓

11. $Cr \rightarrow Cr^{3+} + 3e^-$ $E^\circ = 0.74$

$I_2 + 2e^- \rightarrow 2I^-$ $E^\circ = 0.535$

1.28 volts ✓

$\Delta G = -n(F)(E^\circ)$

$= -6(96485)(1.28)$

$= -7.41 \times 10^5 \frac{J}{mole}$ ✓

12. The chemist should use Fe^{3+} ✓ to oxidize Pb and Pb^{2+}

13. The rate of the reaction decreases. ✓

14. The rate of the constant decreases. ✓

15. $R = k(A)^3(B)$ → $220 = K$

$0.022 = K(0.10)^3(0.10)$

$\frac{0.022}{0.0001} = \frac{K(0.0001)}{0.0001}$

$R = 220 \frac{1}{m^3 \cdot sec} (A)^3(B)$ Rate equation

order of reaction A: 3 ✓

order of reaction B: 1 ✓

overall reaction: $\frac{+}{4}$ ✓

16. $K = \frac{\ln(4.00) - \ln(0.500)}{1.2} = \frac{2.079}{1.2}$

$K = 1.73$

$t_{1/2} = \frac{\ln 2}{1.73} = 0.40 \text{ hrs}$ ✓

17. $k = 1.73$

$A = A_0(e^{-kt})$

$= 4.00 \cdot (e^{-1.73(2.5)}) = 4.00(e^{-4.324})$

$= 0.05 \text{ M}$ ✓

18. $\frac{1}{A} - \frac{1}{A_0} = kt$

$\frac{1}{A} - \frac{1}{5.00} = 0.0150(115)$

$\frac{1}{A} - 0.2 = 1.725$

$+0.2 \quad +0.2$

$\frac{1}{A} = 1.925 \cdot A$

$\frac{1}{1.925} = \frac{1.925 \cdot A}{1.925}$

$A = 0.519\,M$ ✓

19. Rate equation: $R = k(PS_2I)$ ✓

The intermediate is I ✓

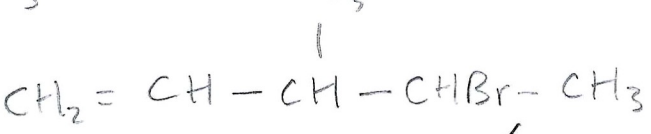
20. The chemical formula for decane is $C_{10}H_{22}$ ✓

21. There are 2 units of unsaturation ✓

22. Base structure ✓

$CH_2 = CH - CH_2 - CH_2 - CH_3$

Lewis structure ✓



23. The name of the compound is 3-bromo 3,4-dimethyl hexane ✓ ✓

24. The name of the compound is 4-methyl 2-pentyne ✓ ✓

25. The product would become 3-bromhexane ✓